

UNDER the joint auspices of the Technical Education Board of the London County Council and of the Geographical Association, two conferences will be held on Thursday, January 7, 1904, in the South-western Polytechnic, Manresa Road, Chelsea. In the morning, at 11 o'clock, Mr. H. J. Mackinder, reader in geography at Oxford, and the appointed teacher of geography in the University of London, will open a discussion on the development of geography out of nature-study. In the afternoon practical methods of teaching geography will be dealt with. Mr. Lomas, of Liverpool, will take up the question of teaching geography by excursions; Mr. T. Alford Smith, St. Dunstan's College, Catford, will describe a method of using the globe and lantern views; Mr. P. F. Kendall, of the Yorkshire College, will discuss methods of making and using models; and Mr. A. J. Herbertson, of the Oxford University School of Geography, will advocate the employment of Ordnance maps in teaching geography, and will, in particular, deal with sheets which are illustrative of typical land forms. In connection with these conferences an exhibition of geographical appliances, maps, and books of use to teachers will be arranged. It will probably be open from Tuesday, January 5, to Saturday, January 9, at the South-western Polytechnic. The Geographical Association has appointed a special committee to select exhibits.

LORD KELVIN on November 13 received the honorary degree of D.Sc. from the University of Wales. On the evening of the previous day he received the honorary membership of the South Wales Engineers' Institute, and in expressing his thanks for the honour, he remarked that engineers all over the world had still a good deal to learn as to the real value of university training. In the matter of the education of foremen in engineering works the Germans had learned how to give them scientific knowledge in a way in which we in England had not given it. It was necessary for the young engineer to learn the practical as well as the theoretical, and this could only be accomplished satisfactorily by the student's spending half his year at the university and half in the workshop, where he might learn to apply the scientific knowledge which he had acquired in the university.

At the Sir John Cass Technical Institute, Aldgate, on Tuesday, November 17, the prizes and certificates gained by students during the past session were distributed by Sir Henry Roscoe. The institute is one of the polytechnics aided by the Technical Education Board of the London County Council and by the City Parochial Foundation. In addition to general instruction in the experimental sciences, art, commercial subjects, and domestic economy, special attention is given to the study of metals both from the scientific and the artistic side. Sir Henry Roscoe, in addressing the students, said that he hoped all present would agree with him that enough had been said about the value of the application of the principles of science and of art to industry, and that the time for work had come. Over and above the ordinary courses of instruction it is of the utmost importance that the higher work of students, especially research work, should be encouraged. What original work teaches is—how to overcome difficulties, how to obtain a mastery over opposing forces, how, in fact, successfully to tackle new problems when they present themselves, as they are ever doing to those who have eyes to see. Without this capability a man can only run in the beaten track, with it he has a weapon in his hand which gives him power to strike out new paths and to open up fresh and fertile ground. As in the scientific sphere, so also in the domain of art—the same guiding spirit holds the fort. Taste needs refinement, hand and eye require training, the craftsman, like the man of science, must be imbued with the spirit of progress as well as with a love of his art. Referring to the relation between the London University and polytechnics as regards internal students, Sir Henry Roscoe remarked that instruction given in the polytechnics must be of a real university type. It would be fatal to the prestige of the university were its necessarily high standard of efficiency lowered to meet the exigencies of the case. The course of study must be an extended one, as the hours devoted to work in the evening

are necessarily shorter than those in the day; but the total time spent in study must be the same for both day and evening students, though a substantial reduction in time has been granted to those regularly employed during the day.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society.—“The Vapour Pressure of Liquid Oxygen on the Scale of the Constant-volume Oxygen Thermometer filled at different Initial Pressures.” By Dr. Morris W. Travers and Dr. Charles J. Fox. Communicated by Sir William Ramsay, K.C.B., F.R.S. Received June 26.

The vapour pressures of liquid oxygen and of liquid hydrogen on the scales of the constant-volume hydrogen and helium thermometers have recently been determined by one of us in conjunction with Dr. A. Jaquerod and Mr. G. Senter, and it has been found that two scales of temperature differ by amounts which increase as the temperature falls (*Phil. Trans.*, A., vol. cc.).

	Vapour pressure	Hydrogen scale	Helium scale
Liquid oxygen ...	760 mm.	90°10	90°20
Liquid hydrogen ..	760	20°22	20°41

These results are in accordance with Callendar's calculations of the deviation from the thermodynamic scale of measurements with thermometers filled at an initial pressure of 1000 mm. of mercury at the melting point of ice. Whether the deviation becomes smaller when the thermometers are filled at a lower pressure has not been determined, and, indeed, with the means at our disposal it would be practically impossible to do so. In order, therefore, to investigate the variation of the readings of the gas thermometer with change of initial pressure, we decided to measure the vapour pressures of liquid oxygen on the scales of the constant-volume oxygen and nitrogen thermometers, for which the deviations from the thermodynamic scale are considerably greater.

Makower and Noble, using the method of Travers and Jaquerod, have found that the pressure coefficient of oxygen at an initial pressure P_0 may be expressed by the formula

$$\alpha = 0.0036642 + 0.0000001457 P_0,$$

where P_0 is expressed in millimetres. Values derived from this expression were employed in calculating the temperatures corresponding to the vapour pressure of liquid oxygen on the scale of the oxygen thermometer filled at different initial pressures.

The results are stated in the following table:—

Gas in thermometer	Pressure on gas in thermometer at ice point	Pressure coefficient	Boiling point of liquid oxygen
Helium	1000 mm.	0.00366425	90°20
Oxygen	1000	0.0036788	88°7 ¹
	731	0.0036748	89°02
	658	0.0036738	89°09
	484	0.0036713	89°31
	336	0.0036692	89°48
	0	0.0036642	99°8 ¹

¹ By extrapolation.

The results show that for very low pressures in the thermometer the oxygen scale converges towards the helium scale. The fact that the deviation does not appear to vanish at low pressures may be due to a tendency on the part of the gaseous molecules to associate at higher pressures.

Mathematical Society, November 12.—Prof. H. Lamb, president, in the chair.—The council and officers for the ensuing session were elected. They are as follows:—president, Prof. Lamb; vice-presidents, Prof. Elliott, Dr. Hobson, Dr. Baker; treasurer, Prof. Larmor; secretaries, Prof. Love and Prof. Burnside; other members of council, Mr. Campbell, Dr. Glaisher, Mr. Grace, Mr. Macdonald, Major MacMahon, Mr. Mathews, Mr. Western, Mr. Whittaker, Mr. A. Young.—The following papers were communicated:—Prof. J. D. Everett, Note on Borgnet's method of dividing an angle in an arbitrary ratio. The method, which depends on the construction of a certain transcendental curve, was given by Borgnet in *Rouen. Acad.*

Travaux, 1839.—Prof. A. E. H. Love, The propagation of wave-motion in an isotropic elastic solid medium. The chief object of the paper is to remove a difficulty in Stokes's memoir on the dynamical theory of diffraction. Stokes's theory was built upon certain expressions for the cubical dilatation and the components of rotation, but these expressions are not always correct. A new foundation is now obtained for the theory in an independent investigation of the effects produced by force applied at one point. A knowledge of these effects renders possible the solution of a number of problems relating to wave-motion in an isotropic elastic solid, among them being the problem discussed by Stokes of the effects of arbitrary initial disturbances. It is proved that, unless certain relations connect the initial velocity and initial strain at points on the boundary of the portion of the medium which is disturbed initially, the strain in the neighbourhood of the centres of principal curvature of this surface will tend to become infinite, and fracture of the material will be produced.—Mr. H. Hilton, On spherical curves. The paper contains a general discussion of the curves on a sphere formed by the intersection of the sphere and any other algebraic surface.—Mr. W. H. Young, On sequences of sets of intervals containing a given set of points. A set of points being taken, intervals are constructed so that each interval has one of the points as an internal point, and the lengths of the intervals are diminished without limit. The author discusses the nature of the aggregate of points which throughout the limiting process remain internal points of the intervals.—The Rev. F. H. Jackson, A formal generalisation of Maclaurin's theorem.—Dr. H. F. Baker, On the Weddle quartic surface. Of the quadric surfaces which pass through six given points, those which pass through a seventh point pass also through an eighth; when these two coincide they must lie on a locus which is the surface under discussion. There is a birational relation between this surface and Kummer's sixteen-nodal quartic, and this relation is interpreted as a linear projection in space of four dimensions. From any point of Weddle's surface there can be derived by linear projections in three dimensions a remarkable figure of 32 points lying on the surface, and the formulae by which the coordinates of these points are connected with those of the first point constitute an Abelian group.—Mr. W. H. Jackson, The theory of diffraction.—Mr. G. H. Hardy, A general theorem concerning absolutely convergent series.—Prof. R. W. Genese, Notes on quaternions, including a geometrical interpretation of $\mathbf{V}\mathbf{a}\mathbf{b}\mathbf{y}$.—Mr. E. T. Whittaker, On the expression of the electromagnetic field by means of two scalar potential functions. It is shown that the electric displacement and magnetic force due to any system of moving electrons can be expressed by second derivatives of two scalar potential functions.—Mr. P. W. Wood, Analogue of the Jordan lemma for four variables.

Entomological Society, October 21.—Prof. E. B. Poulton, F.R.S., president, in the chair.—Mr. J. H. Keys sent for exhibition a black variety of *Carabus nemoralis*, Müll., from Dartmoor.—Mr. G. C. Champion exhibited a series of *Rosalia alpina*, Linn., found by himself on old beech trees at Moncayo, north Spain, in July last.—Mr. A. J. Chitty exhibited a larva of *Dytiscus flavescentes*, taken at Eastling, Kent, near the school buildings.—Colonel J. W. Verbury exhibited *Gastrophilus nasalis*, Linn., taken at Torcross, Devonshire, from August 19 to 31 last. He said that as this rare species differs in a marked degree in its mode of flight, &c., from the common horse bot-fly, *Gastrophilus equi*, it would be as well to direct attention to these differences. *Gastrophilus equi*, when flying round a horse, visits as a rule the belly and the forelegs. The ♀ carries her ovipositor almost horizontal, and she looks, when on the wing, like the lower two-thirds of the letter Z (L), *G. nasalis*, on the other hand, carries the ovipositor tucked under the belly and almost parallel to the axis of the body; this gives her, when on the wing, a peculiar ball-like appearance; *G. nasalis*, too, always flies to the horse's head. As a rule, the horse paid no attention to *G. equi*, but *G. nasalis* caused him great alarm. The eggs of *G. equi* were in hundreds on the shoulders and forelegs of one cart-horse, but although the face and nostrils were searched carefully no signs of eggs or larvæ could be

found thereon. Exhibiting *Chersodromia hirta*, Walk., he said these little Empids were common on the shore near Prawle Point; some were obtained by sweeping over seaweed, while others were running about over the sand. Colonel Verbury also exhibited *Pamponerus germanicus*, Linn., from Barmouth and Porthcawl. He said this rare species appears to be struggling to keep its place in the British list. It appears to frequent the marram grass on the sand hills, and a ♀ taken at Barmouth on June 27 was preying on a beetle.—Mr. A. H. Jones, Mr. H. Rowland-Erown, Dr. T. A. Chapman, and Mr. R. W. Lloyd exhibited specimens of the genus *Melitaea* from various European localities. A discussion on the probable affinities of the several named species which occur in the Alps took place.—The president also exhibited some forms of *M. aurinia* taken by Mr. A. H. Hamm at Basingstoke and elsewhere, and forms of *M. athalia*, *M. didyma*, and *M. phoebe* from Asia Minor and Persia.—Dr. T. A. Chapman exhibited an album showing a series of photographs of the development of the embryo within the egg of *Psammotis hyalinis* taken by Mr. W. H. Hammond and Mr. W. R. Jeffrey.—The president read, and commented upon, a paper received by him on protective coloration in its relation to mimicry, common warning colour, and sexual selection, by Mr. Abbot H. Thayer.

Zoological Society, November 3.—Dr. W. T. Blanford, F.R.S., vice-president, in the chair.—Dr. W. B. Benham communicated a memoir dealing with the aquatic Oligochaeta of New Zealand.—Mr. Oldfield Thomas read a paper on the mammals collected at Chapadá by Mr. A. Robert during the Percy Sladen Expedition to Central Brazil, and presented to the National Museum by Mrs. Percy Sladen. No modern specimens had hitherto been obtained from this little-known region. Thirty-seven species were enumerated, four of which were described as new.—Accounts were also given of the Coleoptera by Messrs. C. J. Gahan and G. J. Arrow, and of the Lepidoptera by Mr. F. A. Heron and Sir George Hampson, Bart., collected during the Percy Sladen Expedition. The former contained an enumeration of 175 species, of which fifteen were described as new, while the latter gave a list of nineteen species, one of which was described as new.—Prof. B. C. A. Windle and Mr. F. G. Parsons communicated a paper on the muscles of ungulates; in it the muscles of the hind limb and trunk were discussed.—Dr. P. Chalmers Mitchell read a note on the distribution of the cypriote spiny mouse. Specimens of this form, recently described as a new species (*Acomys nesiotis*) by Miss Bate, had been presented to the Gardens, and their localities showed that this mouse extended practically all over Cyprus.—Mr. F. E. Beddoe, F.R.S., read a paper on some points in the anatomy, chiefly of the heart and vascular system, of the Japanese salamander (*Megalobatrachus japonicus*).

Anthropological Institute, November 10.—Mr. H. Balfour, president, in the chair.—Dr. F. W. Edridge-Green exhibited a collection of pictures painted by colour-blind persons. Dr. Green divided the colour-blind into two distinct, independent, but associated classes. The first class consisted of persons with a spectrum shortened at one or both ends, who consequently cannot see certain rays. An individual with a shortening of the red end would not be able to see a red light at a distance, although he could pick out all the pieces in a bundle of coloured wools. The second class made mistakes through their inability to recognise the difference between certain colours. Normal sighted persons see six colours, some even seven; the second class of the colour-blind see five, four, three, two, or one colour, according to the degree of their defect, and are called pentachromic, tetrachromic, &c.—The president, on behalf of Mr. Annandale, read a paper on the survival of primitive implements in the Færöes and Iceland, and illustrated the paper with an exhibition of many of the implements alluded to. These included bone skates, a shovel made out of the bone of a whale, a stone lamp, and stone hammers. In the discussion which followed, the great importance of collecting these primitive implements before they entirely vanish with the advance of civilisation was insisted upon.

PARIS.

Academy of Sciences, November 9.—M. Albert Gaudry in the chair.—On the storage of the *n*-rays by certain bodies, by M. R. Blondot. The rays from various sources of light, after being filtered through an aluminium screen, possess the property of increasing the luminosity of a feebly phosphorescent screen. It was noticed when a quartz lens was used that this effect continued after the source of light, an incandescent mantle, was extinguished, and it was then found that quartz, Iceland spar, fluorspar, and various other substances possessed the same property. The rays are stored throughout the whole mass, and take some time to penetrate.—On the determination of invariant figures of cyclic transformations, by M. Rabut.—On the approximation of functions by quadratic surds, by M. S. Pincherle.—Generalisation of the fundamental property of potential, by M. A. de Saint-Germain.—On the laws of displacement of chemical equilibrium, by M. E. Ariès.—The dielectric cohesion of gases at low temperatures, by M. E. Bouty. The dielectric cohesion of a gas at constant volume is constant to within one per cent. for temperatures between -100° C. and $+200^{\circ}$ C.—On a practical solution of the problem of photometry of lights of different colours, by M. Charles Fabry. The method involves the use of a secondary standard of the same colour as the light to be measured. For this standard, the use of a flame is recommended with two coloured solutions of definite composition.—On the scintillation of phosphorescent zinc sulphide, in presence of radium, revivified by electric discharges, by M. Th. Tommasina.—Remarks on the latest group of solar spots and the magnetic disturbances, by M. F. Quénisset. Photographs of the spots taken on October 31, the date of the magnetic storm, show that the area of the sun-spots was only one-third of the area of the spots on October 11, but that on October 31 the spots were accompanied by enormous faculae, and hence the magnetic disturbance is probably to be attributed to the latter.—On the transparency of the sea, by M. Thoulet. A simple relation is given between the distance, y , at which a white circle on a black background just disappears, and the amount of solid matter in suspension, x , xy being constant. The relation has been applied to the determination of the weight of the sediment in suspension in sea water.—The use of balloons containing a subsidiary air balloon according to the theory of General Meusnier, by M. Henry de la Vaulx. An account of two voyages in a balloon fitted with small air balloons, the latter possessing independent valves, and with a rain shield. The device of a subsidiary air balloon, suggested by General Meusnier in 1783, was found to be of great practical value. The balloon is easily kept below the clouds, and a great saving of ballast is effected, rendering longer voyages practicable.—The conditions of separation of iodine in the form of cuprous iodide, in a mixture containing alkaline chlorides, bromides, and iodides, by MM. H. Baubigny and P. Rivals. The separation is effected by an excess of copper sulphate, in the presence of an alkaline arsenite and a little ferrous sulphate.—The action of organo-magnesium compounds upon acetol and its esters, by M. André Kling. In no case was any haloid organic compound formed, hence, comparing with the corresponding reaction with ethylene oxide and epichlorhydrin it follows that acetol and its esters behave as ketonic compounds, and as internal ether oxides of the ethylene oxide type.—The evolution of the compound Ascidians, by M. Antoine Pizon.—On the regeneration in Amphibia of the posterior members and the tail, in the absence of the nervous system, by M. P. Wintrebter. The regeneration of the limbs is not dependent on the nervous system.—Study of the digestive ferment in some invertebrates, by M. Victor Henri. A comparison of the activity of the amylolytic and proteolytic ferment of *Octopus vulgaris*, *Sepia officinalis*, *Spatangus purpureus*, and *Salpa africana* with the activity of the corresponding ferment from the dog.—A new hybrid obtained by grafting, by M. Lucien Daniel.—On the extra floral nectars of Hevea, by MM. Aug. Daguerre and H. Coupin.—Cytological researches on *Galactinia succosa*, by M. R. Maire.—On the oxidation of glucose in the blood, by M. L. Jolly. Alcohol exists naturally in ox blood, in very minute proportion, a portion of which is further oxidised in the blood to acetic acid.

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DIARY OF SOCIETIES.

THURSDAY, NOVEMBER 19.

ROYAL SOCIETY, at 4.30.—The Physiological Action and Antidotes of Colubrine and Viperine Snake Venoms: Dr. L. Rogers.—On the Rapidity of the Nervous Impulse in Tall and Short Individuals: Dr. N. H. Alcock.—Electrometer Records of Secreto-motor Changes: Dr. A. D. Waller, F.R.S.—On the Nematocysts of Aeolids: G. H. Grosvenor.—The Cell Structure of the Cyanophyceæ: H. Wager.

LINNEAN SOCIETY, at 8.—A General View of the Genus *Pinus*: Dr. Maxwell T. Masters, F.R.S.—Contributions to the Embryology of the Amentiferæ. Part II.—*Carpinus Betulus*, Linn.: Miss Dr. M. Benson and Miss Elizabeth Sanday.

FRIDAY, NOVEMBER 20.

INSTITUTION OF MECHANICAL ENGINEERS, at 8.—Roofing Existing Shops while Work is Proceeding: R. H. Fowler.—Experiments on the Efficiency of Centrifugal Pumps: Dr. Thomas E. Stanton.

MONDAY, NOVEMBER 23.

ROYAL GEOGRAPHICAL SOCIETY, at 8.30.—Recent Exploration and Economic Development in Central and Western China: Lieut.-Colonel C. C. Manifold.

SOCIETY OF ARTS, at 8. The Mining of Non-Metallic Minerals: Bennett H. Brough.

TUESDAY, NOVEMBER 24.

ANTHROPOLOGICAL INSTITUTE, at 8.15.—An Engraved Tablet from Easter Island: O. M. Dalton.—The Early Pot Fabrics of Asia Minor: J. L. Myers.

INSTITUTION OF CIVIL ENGINEERS, at 8.—On the Distribution of Mean and Extreme Annual Rainfall over the British Isles: Dr. H. R. Mill.

WEDNESDAY, NOVEMBER 25.

SOCIETY OF ARTS, at 8.—The Universal Exposition at St. Louis, U.S.A., 1904: George F. Parker.

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